NOTICE

All drawings located at the end of the document.

4P103

RMRS Rocky Mountain Remediation Services, L.L.C.
. . . protecting the environment

000058806

INTEROFFICE CORRESPONDENCE

DATE: August 28, 1995

TO: Distribution

FROM: Rick Roberts, Technical Support, Remediation Services, X8508
FAX# 966-8556, Cubicle #315

SUBJECT: STRATEGY FOR PROCEEDING WITH THE 903 PAD AND WINDBLOWN SOILS IM/IRA - RSR-002-95

ACTION: **Review letter and attachments and attend meeting on August 31**

The attached letter outlines the volume of surficial soils that will need to be remediated at the 100 and 15 millirem radiation dose limits at and near the 903 Pad. Acceptable concentrations of radioactive material were calculated using an office worker exposure scenario for areas inside the industrial area fence and an open space exposure scenario for areas outside of the industrial area fence. Assumptions from the RFI/RI Report from OU 2 were used in these calculations. Given the findings of the attached letter, there are two ways to proceed with the 903 Pad and Windblown Soils IM/IRA. These are:

1) Propose no action for the area since the 100 millirem limit is not exceeded for the given exposure scenarios.

2) Propose remediation at the 15 millirem proposed radiation dose standard to be compliant with requirements to be promulgated in the near future.

3) Propose remediation of soils underneath the 903 Pad based on erosional problems at the pad.

A meeting is scheduled to be held at Interlocken in the **small east conference room on Thursday, August 31 at 2PM** to discuss how to proceed with the 903 Pad and Windblown soils IM/IRA. I look forward to meeting with you and coming to a mutually agreed upon strategy for proceeding with the IM/IRA.

Attachment:
As Stated

Distribution:
Susan Evans
Gary Guinn
Linda Guinn
John Hopkins
Gary Konwinski
John Law
Annette Primrose
John Schmuck
ERPD Records File (2)

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PARSONS ENGINEERING SCIENCE, INC.

1700 Broadway, Suite 900 • Denver, Colorado 80290 • (303) 831-8100 • Fax (303) 831-8208

August 24, 1995

Mr. Rick Roberts
Rocky Mountain Remediation Services
Technology Support
P.O. Box 464, Building 080
Golden, CO 80402-0464

Subject: Submittal of the Contaminated Soil Volumes

Dear Mr. Roberts:

Enclosed is a revision to the calculation of areal extent and quantity of contaminated surface soil in the vicinity of the OU2 903 Pad Drum Storage Area. This revised calculation incorporates the modified concentrations that would equate to a 15 mrem and 100 mrem annual dose from radioactivity. The results of this analysis indicate that at the 100 mrem risk level, there are no contaminated soils in the vicinity of the 903 Pad Drum Storage Area (excluding the covered 903 Pad soils). Therefore, the no-further action and institutional control alternatives appear to be the most appropriate under this 100 mrem scenario.

Under the 15 mrem scenario, Americium-241 is a contaminant of concern for approximately 3.1 acres which results in a volume of 3,280 cubic yards. This volume does not include the volume of contaminated soils beneath the 903 Pad Drum Storage Area.

The volume of soil beneath the 903 Pad Drum Storage Area has been previously calculated at 23,740 cubic yards. This volume of soil may need to be remediated based on the erosional problems that occurred in the spring of 1995, and the RMRS goal to conduct a final remedial action through the IM/IRA program.

Therefore, the range of volume estimates is from approximately 3,000 cubic yards to 30,000 cubic yards for the 15 mrem alternative depending upon whether remediation of the 903 Pad Drum Storage Area is included with remediating the hillside surface soils. Under the 100 mrem scenario, the volume is approximately 24,000 cubic yards if final remediation of the 903 Pad Drum Storage Area is desired.

The topic concerning the inclusion of the 903 Pad Drum Storage Area volume in the detailed analysis of alternatives should be discussed at your earliest convenience.

(I:\PROJECTS\726922\18.WPF\08/28/95)

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PARSONS

Please feel free to call me at (303) 831-8100 if you have any questions.

Sincerely,
PARSONS ENGINEERING SCIENCE, INC.

Richard M. Millikin
Project Manager, CMS/FS Phase II

for Rick Millikin

cc: J. Hopkins, RMRS
G. DeWeese
J. Hartfelder
S. Hughes
M. Glade
R. Lux
E. Millikin
P. Nixon
T. Shangraw
R. Wilkinson
S. Woolfolk
Central Files

(I:\PROJECTS\726922\18.WPF\08/28/95)

PARSONS ENGINEERING SCIENCE, INC.

Client RMRS   Job No. 726118   Sheet 1 of 1

Subject OU2 IM/IRA - CONTAMINATED SURFACE SOIL VOLUME ESTIMATES   By EF Krouse, Jr.   Date 23 AUG 95

Checked SR HUGHES   Rev. 2

PURPOSE: RECALCULATE VOLUMES PER CHANGES IN DOSE EQUIVALENTS

EXCAVATION DEPTHS:

903 PAD	40 CM
903 LIP	20 CM
BUFFER ZONE	15 CM

NEW DATA (pCi/g):

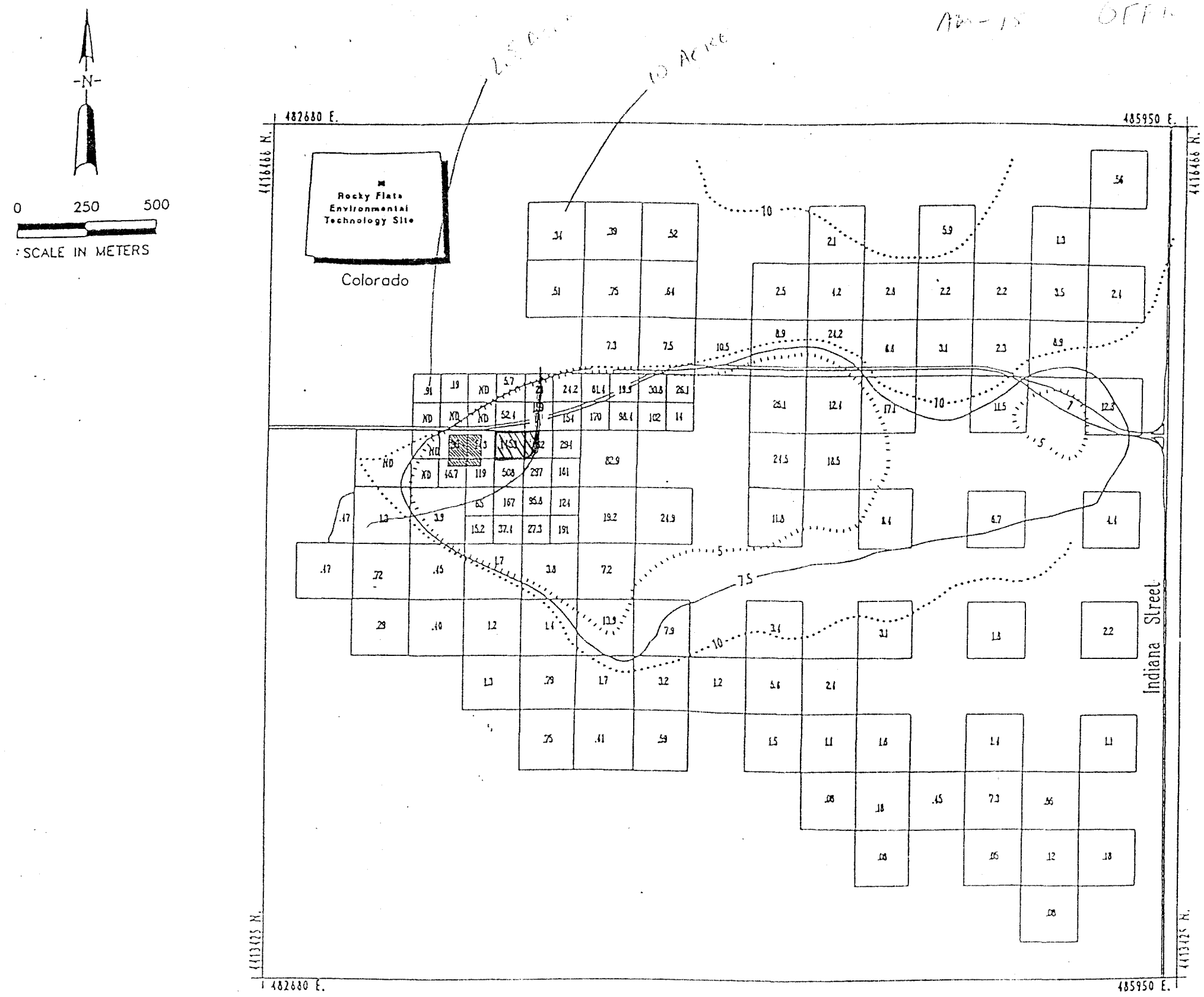
	15 mrem		100 mrem	
	Pu 239	Am 241	Pu 239	Am 241
OFFICE WORKER	1,600	140	11,000	940
OPEN SPACE	16000	1400	110000	9600

ATTACHMENTS 1 AND 2 DISPLAY THE AREAL EXTENT OF SOILS TO BE REMOVED. NO Pu-239 EXCEEDENCES WERE IDENTIFIED. Approximately 3.1 Acres of office worker soils exceeded 15 mrem AM-241 levels. No Exceedences were IDENTIFIED FOR 100 mrem Am-241 case

Total Volume of soil TO Be Removed from 903 PAD (CubicYARDS) =

$$\left(3.1\text{ Acres}\right)\left(\frac{43560\text{ ft}^2}{\text{Acre}}\right)\left(20\text{ cm}\right)\left(\frac{1\text{ in}}{2.54\text{ cm}}\right)\left(\frac{1\text{ ft}}{12\text{ in}}\right)\left(\frac{1\text{ cy}}{27\text{ ft}^3}\right) = 3280\text{ cy}$$

5



Source: Phase II RFI/RI Report 903 Pad, Mound, East Trenches area Operable Unit No. 2

EXPLANATION

- 82.8 — SAMPLING PLOT WITH OBSERVED VALUE (in pCi/g) IN THE CENTER
- Remediation Area
- 5 — 7.5 pCi/g CONTOUR OF Pu-239/240 WITH 90% EMPIRICAL CONFIDENCE LIMITS
- 903 PAD

PRG = 1,389

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden, Colorado

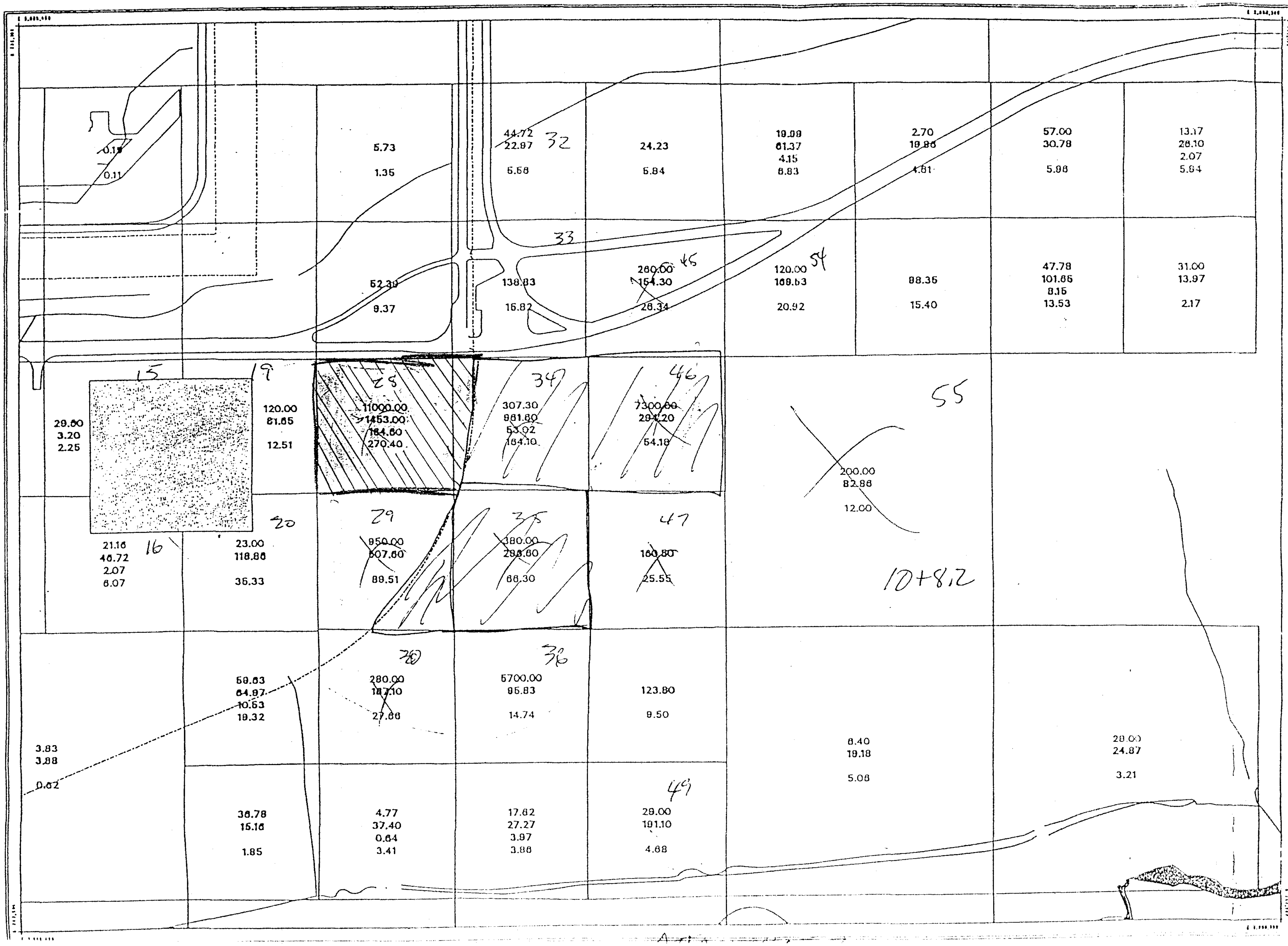
Figure 2.1

Areal Extent of Remediation to a 1 (a)-4 Target Risk Level Based on a PRG Analysis

ATTACHMENT 1

AM-15 (office worker)

38 - Am/Pu ... ...
34 - Am/Pu ... (w ... RFP)



Rocky Flats Surface Soil Sampling Plot Locations Around the 903 Pad

EXPLANATION

903 Pad
Lakes and ponds
Streams, ditches, or other drainage features
Fences
Paved roads

1st Number - Pu 239/240 RFP Result
2nd Number - Pu 239/240 CDH Result
3rd Number - Am 241 RFP Result
4th Number - Am 241 CDH Result

Figure 2.5

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
EG&G ROCKY FLATS
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, Colorado 80402-0464

MAP ID: pad903 May 04, 1995

OU2 DOSE BASED PRGS based on BRA for 100 mrem/yr goal

NOTE: THIS ANALYSIS IS BASED ON EXISTING PRG EQUATIONS AND DOES NOT COMPLY WITH DOE ORDER 5400.5 METHODOLOGY. THIS CALCULATION IS BASED ON EPA HAG; EQUATIONS USED FOR DETERMINING ACTION LEVEL FOR CHEMICALS.

RADIOLOGICAL PROGRAM
TITLE: 100 mrem/yr PRG Calc. OU-2
PAGE: 1 OF 3
PNA. 126792-2
S.W. WOOLFOLK DATE 8/22/95
VERIFIED EQM DATE 8/22/95
Rev. 2

ASSUMPTIONS

VARIABLE DESCRIPTION	UNITS		CT VALUE OFFICE WORKER	CT VALUE OPEN SPACE ADULT/CHILD	RME VALUE OFFICE WORKER	RME VALUE OPEN SPACE ADULT/CHILD
EXPOSURE FREQUENCY	DAYS/YR	EF	219	10	250	25
EXPOSURE TIME	hr/day	ET	7.2	1.5	8	5
DAILY INHALATION RATE	m3/hr	IRa	0.63	0.83	0.83	1.4
EXPOSURE DURATION	YR	ED	1	1	1	1
PARTICULATE EMISSION FACTOR	m3/kg	PEF	7.20E+07	7.20E+07	7.20E+07	7.20E+07
SOIL INGESTION RATE	mg*YR/DAY	IF	5	86	50	60
FRACTION SOIL FROM CONTAMINATED SOURCE		FSCS	1	1	1	1
GAMMA SHIELDING FACTOR		Se	0.5	0.2	0.2	0
GAMMA EXPOSURE FACTOR		Te	1	1	1	1
DOSE GOAL	mrem/YR	dDG	100	100	100	100
RESPIRABLE FRACTION		RF	1	1	1	1
RESPIRATORY DEPOSITION FACTOR		RDF	0.85	0.85	1	1
INGESTION RATE SURFACE WATER/WADING	L/hr	IRW	0	0	0	0
WADING/SURFACE RATE	hr/visit OR hr/day	WR	0	0.5	0	1
WADING/SURFACE EXPOSURE FREQUENCY	visit/year OR days/yr	WRF	0	5	0	15
WATER TO SOIL CONTAMINATION RATIO		WSCR	1	1	1	1

THIS NUMBER WOULD NORMALLY VARY AS A FUNCTION OF WORK ACTIVITIES AND SITE CONDITIONS, TYPICALLY DONE USING RESUSPENSION FACTORS.
THE PEF WAS CALCULATED BASED ON THE ASSUMED SOIL CONCENTRATION AND THE AIR CONCENTRATION BASED ON MODELING DISCUSSED IN THE BRA

RADIONUCLIDE	INHALATION EPA DOSE FACTOR (Sv/Bq)	INGESTION EPA DOSE FACTOR (Sv/Bq)	INHALATION EPA DOSE FACTOR (rem/uCi)	INGESTION EPA DOSE FACTOR (rem/uCi)
Pu-239	8.33E-05	1.40E-08	3.08E+02	5.18E-02
Pu-240	8.33E-05	1.40E-08	3.08E+02	5.18E-02
Am-241	1.20E-04	9.84E-07	4.44E+02	3.64E+00

"=S21"3700000"
"=T21"3700000"

EFFECTIVE DOSE EQUIVALENT FACTOR (50 YEARS) (rem/uCi)

RADIONUCLIDE	Pu-239	Pu-240	U-234	U-238	Th-234	Am-241	U-235	Th-231
INHALATION	3.08E+02	3.08E+02	1.30E+02	120	0.00E+00	4.44E+02	1.20E+02	0.00E+00
INGESTION	5.18E-02	5.18E-02	2.60E-02	2.30E-01	0.00E+00	3.64E+00	2.50E-01	0.00E+00
EXTERNAL SURFACE	3.48E-06	7.54E-06	7.42E-06	9.89E-05	NA	2.75E-04	1.75E-03	NA

(rem/yr)/(pCi/g)

NOTE: PU AND AM INHALATION AND INGESTION DOSE FACTORS ARE BASED ON "LIMITING VALUES OF INTAKE AND AIR CONCENTRATION AND DOSE CONVERSION FACTOR FOR INHALATION, SUBMERSION, AND INGESTION (FEDERAL GUIDANCE REPORT NO. 11). SINCE THE OTHER RADIONUCLIDES ARE NOT ADDRESSED IN THE BRA THEY ARE STILL BASED ON DOE/EH-0071. NOTE, THE DIFFERENCES ARE NOT ACTUALLY SIGNIFICANT.

UPTAKE CHARACTERISTICS

	INHALATION	INGESTION
Y		1.00E-05
W		1.00E-03

ELEMENT
PLUTONIUM
AMERICIUM

8

OU2 DOSE BASED PRGS based on BRA for 100 mrem/yr goal

NOTE: THIS ANALYSIS IS BASED ON EXISTING PRG EQUATIONS AND DOES NOT COMPLY WITH DOE ORDER 5400.5 METHODOLOGY. THIS CALCULATION IS BASED ON EPA RAGS EQUATIONS USED FOR DETERMINING ACTION LEVEL FOR CHEMICALS.

		BASED ON RME VALUES					
		K1	K2	KX	K1	K2	KX
	PRG CALCULATION	"=F39"F$10"F$11"F$19"F$20"F$12/F$13"	"=F$12"F$9"0.000001"F$14	"=F$12"(1-F$16)"F$17"F$10/24"100"F9/365	"=L39"L$10"L$11"L$19"L$20"L$12/L$13"	"=L$12"L39"0.001"L$14"	"=L12"(1-L16)"L17"L10/24"100"L9/365"
BASED ON CT VALUES							
OFFICER WORKER		1.17E-05	1.10E-03	9.00E+01			
OPEN SPACE		1.47E-07	8.60E-04	1.37E+00			

OFFICER WORKER				2.31E-05	1.25E-02	1.83E+02	
OPEN SPACE				2.43E-06	1.50E-03	1.43E+01	

PRG CALCULATION FOR CT

RADIONUCLIDE			OFFICER WORKER			OPEN SPACE	
Pu-239	3.67E-03	3.13E-04	2.51E+04	8.98E-05	4.76E-06	1.06E+06	
Pu-240	3.67E-03	6.79E-04	2.30E+04	8.98E-05	1.03E-05	9.98E+05	
U-234	1.55E-03	6.68E-04	4.50E+04	4.15E-05	1.02E-05	1.94E+06	
U-235	1.68E-03	1.57E-01	8.29E+02	2.33E-04	2.40E-03	3.80E+04	
U-238	1.66E-03	8.90E-03	9.47E+03	2.15E-04	1.35E-04	2.85E+05	
Am-241	9.19E-03	2.48E-02	2.95E+03	3.20E-03	3.77E-04	2.80E+04	

PRG CALCULATION FOR RME

RADIONUCLIDE			OFFICER WORKER			OPEN SPACE	
Pu-239	7.75E-03	6.35E-04	1.19E+04	8.27E-04	4.96E-05	1.14E+05	
Pu-240	7.75E-03	1.38E-03	1.10E+04	8.27E-04	1.08E-04	1.07E+05	
U-234	3.32E-03	1.36E-03	2.14E+04	3.55E-04	1.06E-04	2.17E+05	
U-235	5.89E-03	3.19E-01	3.07E+02	6.67E-04	2.50E-02	3.90E+03	
U-238	5.64E-03	1.81E-02	4.22E+03	6.37E-04	1.41E-03	4.88E+04	
Am-241	5.57E-02	5.02E-02	9.43E+02	6.54E-03	3.93E-03	9.56E+03	

The ingestion of surface water is not included in the evaluation since, based on the Baseline Risk Assessment it is not a significant contributor to the dose.

THE GRAYTONE ROW SECTION'S EQUATIONS ARE SHOWN BELOW.

"=($C49"$D$30+($D49"F15)"D31)" "=($C50"$D$30+($D50"G15)"D31)"
"=$E49"$D$34" "=$E50"D34"
"=(F18)/($E56+$F56)" "=(G18)/($H56+$I56)"

"=($I49"$D$30+($J49"L15)"D31)" "=($I50"$D$30+($J50"M15)"D31)"
"=$K49"$D$34" "=$K50"D34"
"=(L18)/($M56+$N56)" "=(M18)/($P56+$Q56)"

RADIOLOGICAL PROGRAM
TITLE: 100 mrem Soil Conc. Ou
PAGE: 2 OF 3
NNA. 726992-C
S.W. WOOLFOLK DATE 8/22/95
VERIFIED Egm DATE 8/22/95
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	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Pu-239		3.78E-02		3.48E-06		ASSUMES THAT THE TOP 5 cm OF SOIL ARE LOCATED ON THE SURFACE AND THERE IS NO CONTRIBTION FROM SOIL BELOW THIS DEPTH.					
2		Pu-240		8.20E-02		7.54E-06			Soil Depth (cm)	Soil Density (pCi/g)	"=I40*j40		
3		U-234		8.07E-02		7.42E-06			5	1.84	9.20E-05		
4		U-235	1.91	1.90E+01		1.75E-03							
5		U-238	1.01	1.07E+00		9.89E-05							
6		Am-241		2.99		2.75E-04							
7													
8			THORIUM PROGENY	"=17.1+C41"		"=D39*).000085"			DFa(rem*g/pCi/yr)=DFa (mrem*sqm/uCi/yr)*1uCi/1E6pCi*d(cm)*p(g/cc)*1E4sqcm/sqm*1rem/1e3mrem				
9													
10		DOSE FACTORS BASE ON VALUES IN DOE/EH-0070 FOR AREAL CONTAMINATION.											
11													
12													
13													
14													
15													

RADIOLOGICAL PROGRAM
TITLE: (00 mrem Soil Conc. Ci
PAGE: 3 OF 3
RWA 726992-2
S.M. [illegible] DATE 8/22/95
VERIFIED EQM DATE 8/22/95
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RADIOLOGICAL PROGRAM
TITLE: 15 mrem Soil Conc. OU-2
PAGE: 1 OF 3
NNA. 226-992-1
SW. WOOLFOLK DATE: 8/22/95
VERIFIED DATE 8/22/95
Rev. 2

OU2 DOSE BASED PRGS based on BRA for 15 mrem/yr goal

NOTE: THIS ANALYSIS IS BASED ON EXISTING PRG EQUATIONS AND DOES NOT COMPLY WITH DOE ORDER 5400.5 METHODOLOGY. THIS CALCULATION IS BASED ON EPA RAGs EQUATIONS USED FOR DETERMINING ACTION LEVEL FOR CHEMICALS.

ASSUMPTIONS

VARIABLE DESCRIPTION	UNITS		CT VALUE OFFICE WORKER	CT VALUE OPEN SPACE ADULT/CHILD	VARIABLE DESCRIPTION	UNITS		RME VALUE OFFICE WORKER	RME VALUE OPEN SPACE ADULT/CHILD		
EXPOSURE FREQUENCY	DAYS/YR	EF	219	10	EXPOSURE FREQUENCY	DAYS/YR	EF	250	25		
EXPOSURE TIME	hr/day	ET	7.2	1.5	EXPOSURE TIME	hr/day	ET	8	5		
DAILY INHALATION RATE	m3/hr	IRa	0.63	0.83	DAILY INDOOR INHALATION RATE	m3/hr	IRa	0.83	1.4	6.64	7
EXPOSURE DURATION	YR	ED	1	1	EXPOSURE DURATION	YR	ED	1	1	"=L11*L10	"=M11*M10"
PARTICULATE EMISSION FACTOR	m3/kg	PEF	7.20E+07	7.20E+07	PARTICULATE EMISSION FACTOR	m3/kg	PEF	7.20E+07	7.20E+07		
SOIL INGESTION RATE	mg/DAY	IF	5	86	SOIL INGESTION RATE	mg/DAY	IF	50	60		
FRACTION SOIL FROM CONTAMINATED SOURCE		FSCS	1	1	FRACTION SOIL FROM CONTAMINATED SOURCE		FSCS	1	1		
GAMMA SHIELDING FACTOR		Se	0.5	0.2	GAMMA SHIELDING FACTOR		Se	0.2	0		
GAMMA EXPOSURE FACTOR		Te	1	1	GAMMA EXPOSURE FACTOR		Te	1	1		
DOSE GOAL	mrem/YR	dDG	15	15	DOSE GOAL	mrem/YR	dDG	15	15		
RESPIRABLE FRACTION		RF	1	1	RESPIRABLE FRACTION		RF	1	1		
RESPIRATORY DEPOSITION FACTOR		RDF	0.851	0.85	RESPIRATORY DEPOSITION FACTOR		RDF	1	1		
INGESTION RATE SURFACE WATER/WADING	L/hr	IRW	0	0	INGESTION RATE SURFACE WATER/WADING	L/hr	IRW	0	0		
WADING/SURFACE RATE	hr/visit OR hr/day	WR	0	0.5	WADING RATE/SURFACE WATER EXP	hr/visit OR hr/day	WR	0	1		
WADING/SURFACE EXPOSURE FREQUENCY	visit/year OR days/yr	WRF	0	5	WADING/SURFACE EXPOSURE FREQUENCY	visit/year OR days/yr	WRF	0	15		
WATER TO SOIL CONTAMINATION RATIO		WSCR	1	1	WATER TO SOIL CONTAMINATION RATIO		WSCR	1	1		

THIS NUMBER WOULD NORMALLY VARY AS A FUNCTION OF WORK ACTIVITIES AND SITE CONDITIONS, TYPICALLY DONE USING RESUSPENSION FACTORS.

THE PEF WAS CALCULATED BASED ON THE ASSUMED SOIL CONCENTRATION AND THE AIR CONCENTRATION BASED ON MODELING DISCUSSED IN THE BRA

RADIONUCLIDE	INHALATION EPA DOSE FACTOR (Sv/Bq)	INGESTION EPA DOSE FACTOR (Sv/Bq)	INHALATION EPA DOSE FACTOR (rem/uCi)	INGESTION EPA DOSE FACTOR (rem/uCi)
Pu-239	8.33E-05	1.40E-08	3.08E+02	5.18E-02
Pu-240	8.33E-05	1.40E-08	3.08E+02	5.19E-02
Am-241	1.20E-04	9.84E-07	4.44E+02	3.64E+00

"=S21*3700000" "=T21*3700000"

EFFECTIVE DOSE EQUIVALENT FACTOR (50 YEARS) (rem/uCi)

RADIONUCLIDE	Pu-239	Pu-240	U-234	U-238	Th-234	Am-241	U-235	Th-231
INHALATION	3.08E+02	3.08E+02	1.30E+02	120	0.00E+00	4.44E+02	1.20E+02	0.00E+00
INGESTION	5.18E-02	5.18E-02	2.60E-02	2.30E-01	0.00E+00	3.64E+00	2.50E-01	0.00E+00
				(rem/yr)/(pCi/g)				
EXTERNAL SURFACE	3.48E-06	7.54E-08	7.42E-06	9.89E-05	NA	2.75E-04	1.75E-03	NA

NOTE: PU AND AM INHALATION AND INGESTION DOSE FACTORS ARE BASED ON "LIMITING VALUES OF INTAKE AND AIR CONCENTRATION AND DOSE CONVERSION FACTOR FOR INHALATION, SUBMERSION, AND INGESTION (FEDERAL GUIDANCE REPORT NO. 11). SINCE THE OTHER RADIONUCLIDES ARE NOT ADDRESSED IN THE BRA THEY ARE STILL BASED ON DOE/EH-0071. NOTE, THE DIFFERENCES ARE NOT ACTUALLY SIGNIFICANT.

UPTAKE CHARACTERISTICS

	INHALATION	INGESTION	ELEMENT
Y		1.00E-05	PLUTONIUM
W		1.00E-03	AMERICIUM

OU2 DOSE BASED PRGS based on BRA for 15 mrem/yr goal

NOTE: THIS ANALYSIS IS BASED ON EXISTING PRG EQUATIONS AND DOES NOT COMPLY WITH DOE ORDER 5400.5 METHODOLOGY. THIS CALCULATION IS BASED ON EPA RAGs EQUATIONS USED FOR DETERMINING ACTION LEVEL FOR CHEMICALS.

BASED ON RME VALUES

	K1	K2	KX		K1	K2	KX
PRG CALCULATION	"=F$9*F$10*F$11*F$19*F$20*F$12/F$13"	"=F$12*F$9*0.000001*F$14"	"=F$12*(1-F$18)*F$17*F10/24*1000*F9/365"		"=L$9*L$10*L$11*L$19*L$20*L$12/L$13"	"=L$12*L$9*0.001*L$14"	"=L12*(1-L16)*L17*L10/24*1000*L9/365*
BASED ON CT VALUES							
OFFICER WORKER	1.17E-05	1.10E-03	9.00E+01	OFFICER WORKER	2.31E-05	1.25E-02	1.83E+02
OPEN SPACE	1.47E-07	8.60E-04	1.37E+00	OPEN SPACE	2.43E-06	1.50E-03	1.43E+01

PRG CALCULATION FOR CT

RADIONUCLIDE	OFFICE WORKER			OPEN SPACE		
Pu-239	3.68E-03	3.13E-04	3.76E+03	8.98E-05	4.76E-06	1.59E+05
Pu-240	3.68E-03	6.79E-04	3.44E+03	8.98E-05	1.03E-05	1.50E+05
U-234	1.55E-03	6.68E-04	6.75E+03	4.15E-05	1.02E-05	2.90E+05
U-235	1.68E-03	1.57E-01	9.43E+01	2.33E-04	2.40E-03	5.71E+03
U-238	1.66E-03	8.90E-03	1.42E+03	2.15E-04	1.35E-04	4.28E+04
Am-241	9.20E-03	2.48E-02	4.42E+02	3.20E-03	3.77E-04	4.20E+03

PRG CALCULATION FOR RME

RADIONUCLIDE	OFFICE WORKER			OPEN SPACE		
Pu-239	7.75E-03	6.35E-04	1.79E+03	8.27E-04	4.96E-05	1.71E+04
Pu-240	7.75E-03	1.38E-03	1.64E+03	8.27E-04	1.08E-04	1.61E+04
U-234	3.32E-03	1.36E-03	3.21E+03	3.55E-04	1.06E-04	3.25E+04
U-235	5.89E-03	3.19E-01	4.61E+01	8.67E-04	2.50E-02	5.85E+02
U-238	5.64E-03	1.81E-02	8.33E+02	6.37E-04	1.41E-03	7.33E+03
Am-241	5.57E-02	5.02E-02	1.42E+02	6.54E-03	3.93E-03	1.43E+03

The ingestion of surface water is not included in the evaluation since, based on the Baseline Risk Assessment it is not a significant contributor to the dose.

THE GRAYTONE ROW SECTION'S EQUATIONS ARE SHOWN BELOW.

	"=($C49*$D$30+($D49*F15)*D31)"	"=($C50*$D$30+($D50*G15)*D31)"		"=($I49*$D$30+($J49*L15)*D31)"	"=($I50*$D$30+($I50*M15)*D31)"	
	"=$E49*$D$34"	"=$E50*$D$34"		"=$K49*$D$34"	"=$K50*$D$34"	
	"=(F18)/($E56+$F56)"		"=(G18)/($H56+$I56)"	"=(L18)/($M56+$N56)"	"=(M18)/($P56+$Q56)"	

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	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Pu-239		3.78E-02		3.48E-06		ASSUMES THAT THE TOP 5 cm OF SOIL ARE LOCATED ON THE SURFACE AND THERE IS NO CONTRIBTION FROM SOIL BELOW THIS DEPTH.					
2		Pu-240		8.20E-02		7.54E-06			Soil Depth (cm)	Soil Density (pCi/g)	"=I40*j40		
3		U-234		8.07E-02		7.42E-06			5	1.84	9.20E-05		
4		U-235	1.91	1.90E+01		1.75E-03							
5		U-238	1.01	1.07E+00		9.89E-05							
6		Am-241		2.99		2.75E-04							
7													
8			THORIUM PROGENY	"=17.1+C41"		"=D39*0.000085"			DFa (rem*g/pCi/yr)=DFa (mrem*sqm/uCi/yr)*1uCi/1E6pCi*d(cm)*p(g/cc)*1E4sqcm/sqm*1rem/1e3mrem				
9													
10		DOSE FACTORS BASE ON VALUES IN DOE/EH-0070 FOR AREAL CONTAMINATION.											
11													
12													
13													
14													
15													

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